UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,894	10/30/2000	Mukund Padmanabhan	YOR20000388US1	7224

35195 7590 06/01/2006

FERENCE & ASSOCIATES
409 BROAD STREET
PITTSBURGH, PA 15143

EXAMINER
PIERRE, MYRIAM

ART UNIT	PAPER NUMBER
2626	

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/699,894	PADMANABHAN ET AL.	
	Examiner	Art Unit	
	Myriam Pierre	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-2, 4-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's arguments filed 03/13/2006 regarding Office Action of 12/12/2005, the proposed changes are approved by the examiner, amending of claims 1, 7, and 13; cancellation of claims 3 and 9; and new claims 14-18.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/13/2006 has been entered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, each element in the formula such as: D_{Θ}, C, Θ, Θ^{T} , Σ_i ,Σ_j μ_i μ_j S_i , p, i and j.

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification, as originally filed, fails to provide support for the invention as it is now claimed. Specifically, the specification fails to disclose "wherein said minimizing step is performed non-incrementally". The specification, page 11 lines 10-12 disclose ..."minimize an upper bound"..., but fails to disclose minimizing step performed non-incrementally.

Response to Arguments

7. Applicant's arguments filed 03/13/2006 have been fully considered but they are not persuasive.

Rejection under 35USC 102 (b)

Applicant argues that neither reference (Watanabe et al. (5,754,681) (now referred as Watanabe) or (Chittineni)), teaches or suggests minimizing the probability of subsequent misclassification non-incrementally. Examiner respectfully disagrees. Watanabe does teach "on the feature of minimizing the probability of subsequent misclassification of at least one feature classifier" (Fig. 7 steps 4-5, col. 18 lines 9-24, col. 24 lines 51-60, and lines 15-30). Moreover, Watanabe also teaches in batch (nonincremental) processing. According to Littman L., Michael in "Gradient Descent" (http://www.cs.duke.edu/courses/cps271/spring99/lect-10/) "when a new input/output pair is received, the learning agent can: discard the current h(x) and develop a new

h(x) using all input pairs received so far (nonincremental or "batch"). Watanabe teach batch or nonincremental processing, and also teach minimizing misclassification. Watanabe do teach minimizing the probability of subsequent misclassification non-incrementally.

Rejection under 35USC 103 (a)

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Thus, one of ordinary skill in the art would be motivated to use Chittineni et al. minimizing of divergence in pattern recognition into Watanabe's parameterized signal pattern recognition in order to reduce error probability and the motivation to use Guorong et al. distance feature selection with Watanabe in order to select the most optimum possibility. The mathematics is obviously known in the process of minimizing divergence in pattern recognition, when implementing pattern recognition into signal processing, why not look into probability or statistical calculations to reduce error by either measuring the optimal chances for a match or mismatch? The applicant is stating that there is "no reason to combine", however, the motivation is clearly well known in the art, to minimize error in pattern recognition and/or seek the optimal choice in pattern recognition via the well known statistics/mathematical process taught by both Chittineni et al. and Guorong et al.

Claim Rejections - 35 USC 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 4-7 and 10-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Watanabe et al. (U.S. Patent 5,754,681 A).

Regarding claims 1, 7 and 13, Watanabe et al teach the process of providing pattern recognition as follows:

an input interface for inputting a pattern (200 in figure 1); transforming the input pattern to provide a set of at least one feature for a classifier (1 in figure 2);

minimizing the probability of subsequent misclassification of at Least one feature in the classifier (column 18 lines 9-24, Fig. 7 steps 4-5, col. 23 lines 50-59 and col. 24 lines 15-30)

developing an objective function (column 18 lines 59-68); and

optimizing the objective function through gradient descent (column 19 lines 8-9). minimizing step is performed (batch) non-incrementally (col. 19 lines 1-10, gradient method step descent in batch processing).

Regarding claims 4 and 10, which depend on claims 1 and 7, respectively, Watanabe et al teach the feature of querying whether the optimized objective function converges (column 21 line 8).

Regarding claims 5 and 11, which depend on claims 4 and 10, respectively, Watanabe et al teach the feature of repeating an optimizing step if the optimized objective function does not converge (column 24 line 22).

Regarding claims 6 and 12, which depend on claims 4 and 10, respectively. Watanabe et al. teach the feature that pattern recognition is speech recognition (column 1, lines 10-15).

Regarding claim 14, which depends on claim 1, Watanabe et al. teach wherein said objection function is an average pairwise divergence related to the probability of is classification of the projected space based on classes having uniform prior probabilities (col. 18 lines 7-35 and 54-67; col. 7 lines 1-8; col. 18 lines 11-28 and 60-67).

Regarding claim 15, which depends on claim 14, Watanabe et al. teach wherein the gradient descent comprises matrix differentiation in which a multidimensional matrix is analyzed nonincrementally (col. 19 lines 1-10).

Regarding claim 16, which depends on claim 14, Watanabe et al. teach the steps of maximizing said average pairwise divergence via numerical optimization routines (col. 10 lines 35-67; equations 6-7 for min and max divergence).

Regarding claim 17, which depends on claim 1, Watanabe et al. teach said objection function comprises means, covariance, and prior probabilities (col. 16 lines 32-45 and 63-67).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al (5,754,681) in view of Chittineni et al. ("On the Maximization of Divergence in Pattern Recognition - Correspondence", IEEE Transactions on Information Theory, September 1976).

Regarding claims 2 and 8, which depend on claims 1 and 7, Watanabe et al do not specifically mention maximizing average pair divergences.

However, Chittineni et al. do teach the feature of maximizing an average piece-wise divergence (page 59 Lines 6-7).

Therefore, it would be obvious to a person of ordinary skill in the art of at the time of the invention to implement divergence maximization of Chittineni et al. into the pattern recognition of Watanabe et al., because Chittineni et al. teach that this would provide reduce error probability, page 1 introduction.

9. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al

(5,754,681) in view of Decell et al. (An iterative approach to the feature selection problem, Machine Processing of remote sensing data, 1972).

As to claim 18, Watanabe et al. do not teach the equation:

$$D_g = \frac{1}{C(C-1)} trace\left\{\sum_{i=1}^{C}\left(\theta \Sigma_i \theta^T\right)^{-1} \theta S_i \theta^T\right\} - p \qquad \text{where } S_i = \sum_{j=1}^{C} \Sigma_j + (\mu_i - \mu_j)(\mu_i - \mu_j)^T,\ i = 1, \ldots, C.$$

However, Decell et al. do teach

$$D_g = \frac{1}{C(C-1)} trace\left\{\sum_{i=1}^{C}\left(\theta \Sigma_i \theta^T\right)^{-1} \theta S_i \theta^T\right\} - p \qquad \text{where } S_i = \sum_{j=1}^{C} \Sigma_j + (\mu_i - \mu_j)(\mu_i - \mu_j)^T,\ i = 1, \ldots, C.$$

(page 3B5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the signal pattern recognition of Watanabe et al. into the feature selection of Decell et al., because Decell et al. teach that this would provide minimal probability of misclassification, page 3B1, Introduction.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Myriam Pierre whose telephone number is 571-272-7611. The examiner can normally be reached on 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on 571-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MP

5/22/06

VIJAY CHAWAN
PRIMARY EXAMINER